National R&D TOPICS

Mid-Western Hydraulics Conference

E. Lansing, Mich.

August 26-28, 2003

J. Sterling Jones

FHWA Contracts

- **FESWMS**
  - –Contractor: Univ of Ky/Parsons Brinkerhoff P.I.: Dave Froehlich
  - –FHWA-RD-03-023 FESWMS 1D Manual
  - –FHWA-RD-03-023 FESWMS 2DH Manual
- **Performance of Bridges During Floods**
  - –Contractor: USGS; P.I.: Dave Mueller
  - –FHWA-RD-01-041
  - –Report Prepared for Posting on TFHRC website

FHWA Contracts

- **Extrapolation of Laboratory Model Scour Results to Field Conditions**
  - **Contractor: Univ. of Fl/USGS BRD Lab at Turner's Falls, Mass./Univ of Aukland**
  - **P.I.: Max Sheppard**
  - **Phase 1 Report on CD available on request (Sterling Jones 202-493-3043)**

FHWA Contracts

- **Abutment Scour for Compound Channels**
  - Contractor: Ga Tech (Sturm)
  - FHWA-RD-99-156 PDF file available on request
  - Report Prepared for Posting on TFHRC website
- **Effects of Gradation and Cohesion on Bridge Scour**
  - Contractor: Hydrautech (Molinas)
  - FHWA-RD-99- 189
  - Report Prepared for Posting on TFHRC website

FHWA Contracts

- **SC Abutment Scour DATA**
  - Contractor: USGS (Stephen Benedict)
  - Report and Data to be published as USGS Open File Report
  - Phase 2 will include EFA Tests
- **Bridge Scour Prediction Event at First International Conference on Scour at Foundations (1st ICSF)**
  - Contractor: Texas A&M (Briaud)
  - Volume 3 of Conference Proceedings to be posted on Texas A&M Web page for five years

FHWA Contracts

- **Coastal Transportation Engineering Research**
  - Contractor: USA (Scott Douglas)
  - Phase 2 Being negotiated 08/03
  - Scott Douglas to make presentation at the Mid-Western conference

FHWA Hydraulics Lab

- Scour at Complex Piers
  - Extending Curves to Pile Caps Located Below Orig Bed
- Scour and Scour Protection of Bottomless Culverts
- Culvert Entrance Studies for SD

FHWA Hydraulics Lab

- **Woodrow Wilson Bridge Study**
  - Physical and Numerical 3-D Models
- **Enhancements to HYRISK**
  - multi-purpose prioritization program for bridge scour evaluations

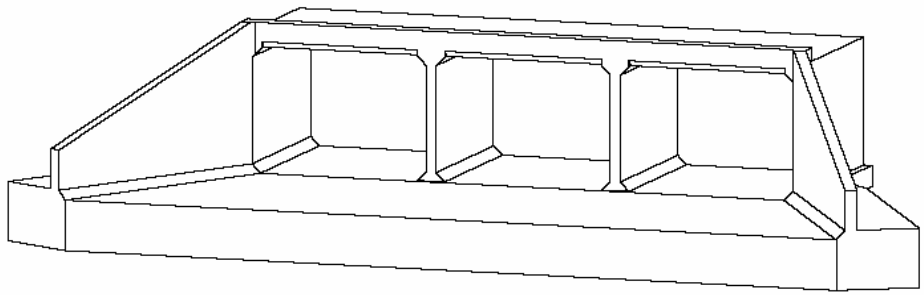
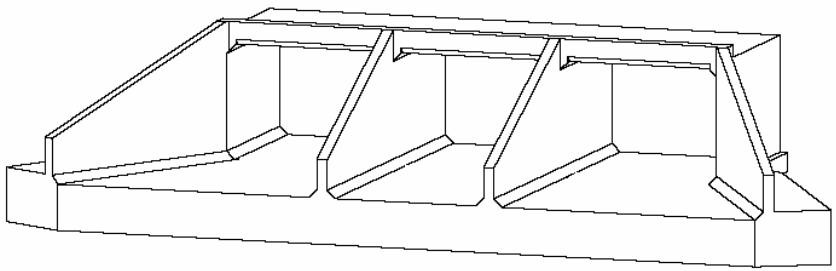
Debris Sweeper Tests

Md DOT Bottomless Culverts

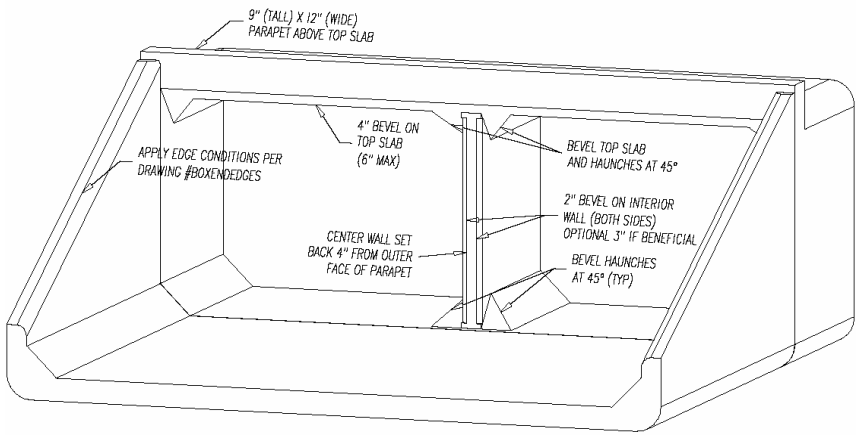
SD DOT Effects of Inlet Geometry on Flow Capacity Of …Box Culverts

U.S. Department
of Transportation
**Federal Highway
Administration**

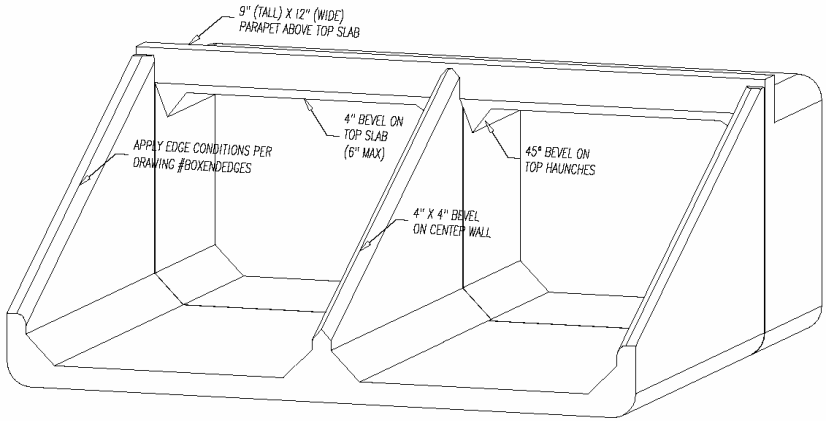
MULTIPLE BARREL TESTS (CIP)
SD DOT

	**FC-T-30**
	**FC-T-0-30-E**

MULTIPLE BARREL TESTS (PRECAST)

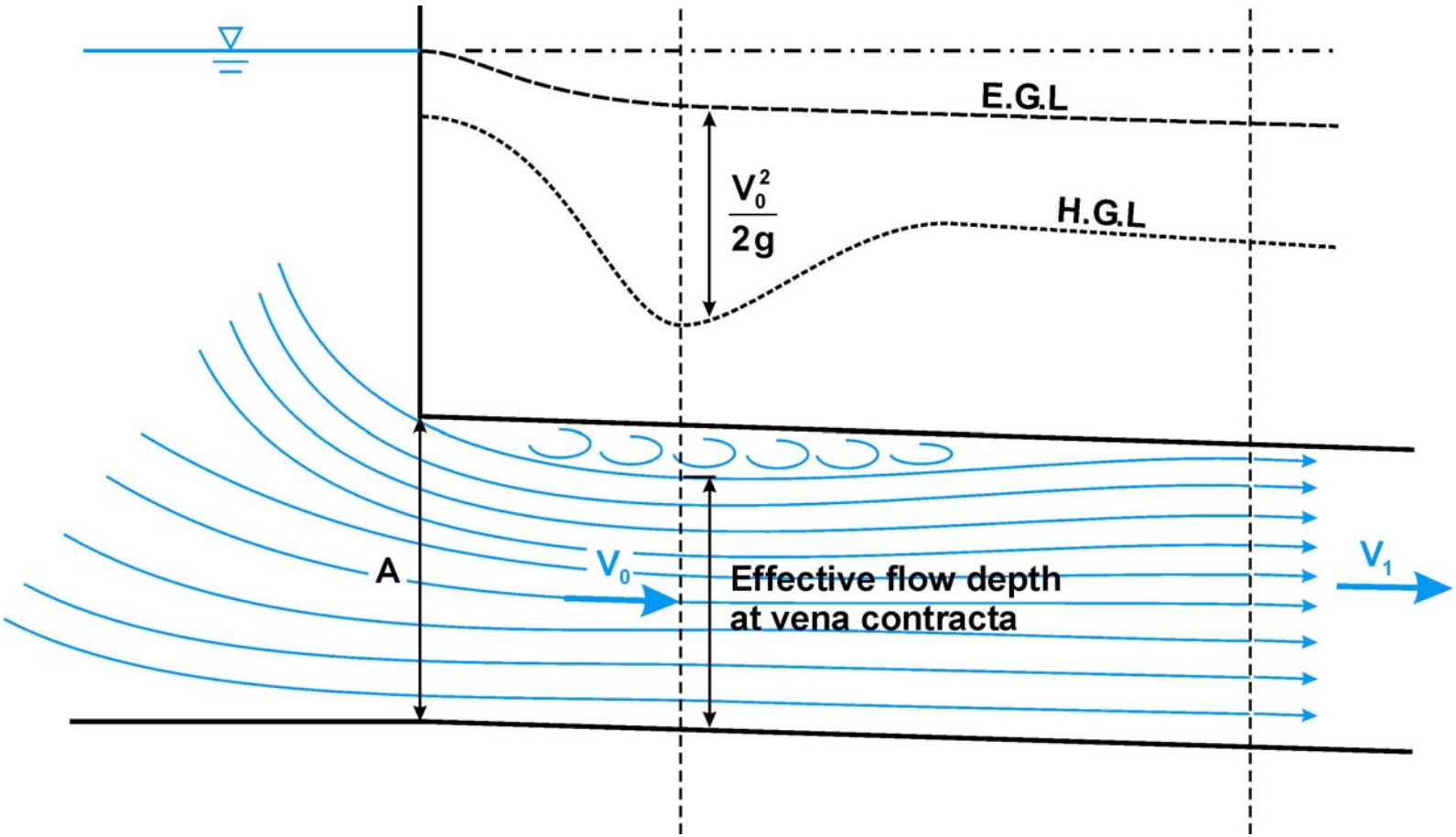


PC-D-1
or
PC-D-3

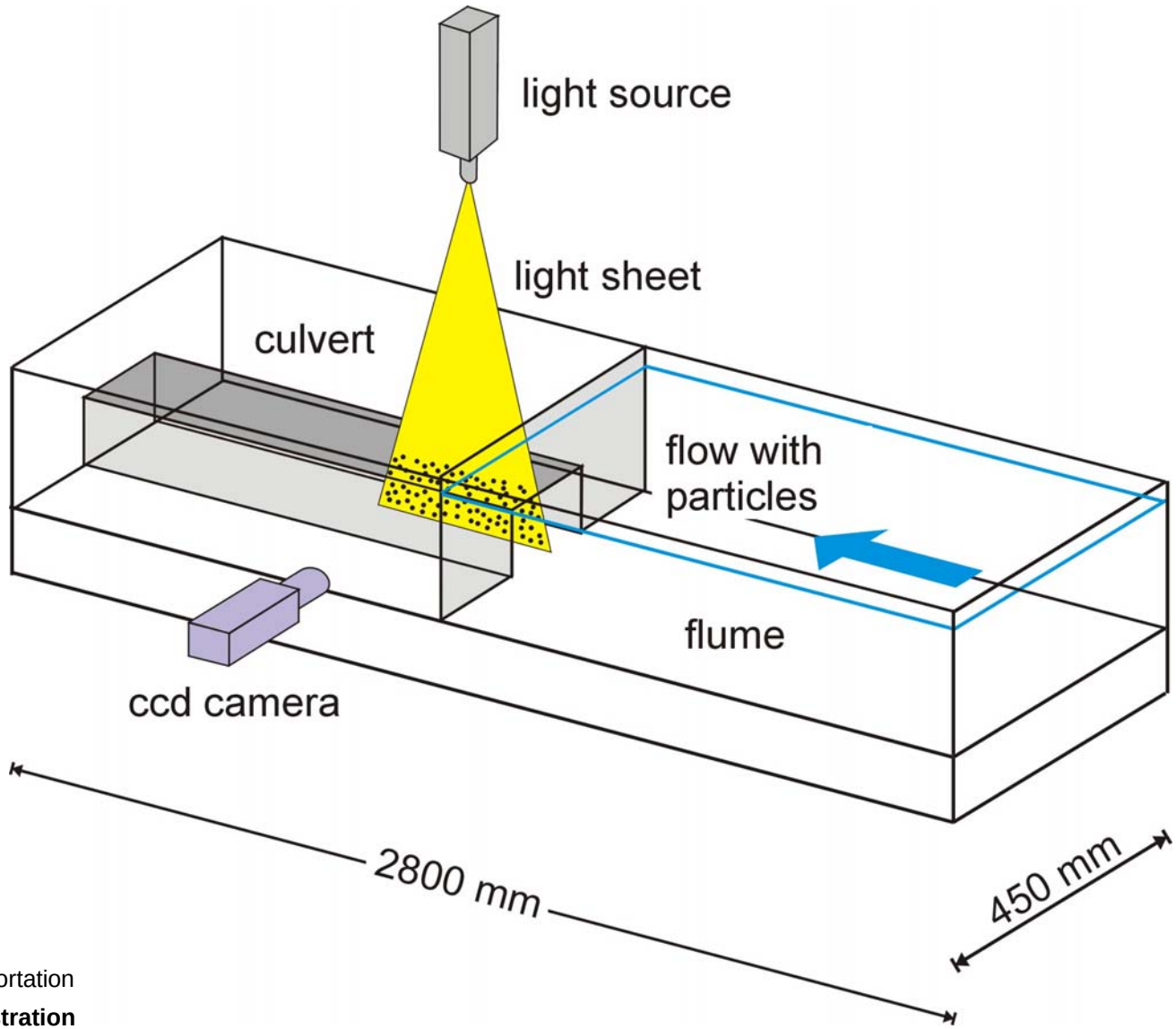


PC-D-E

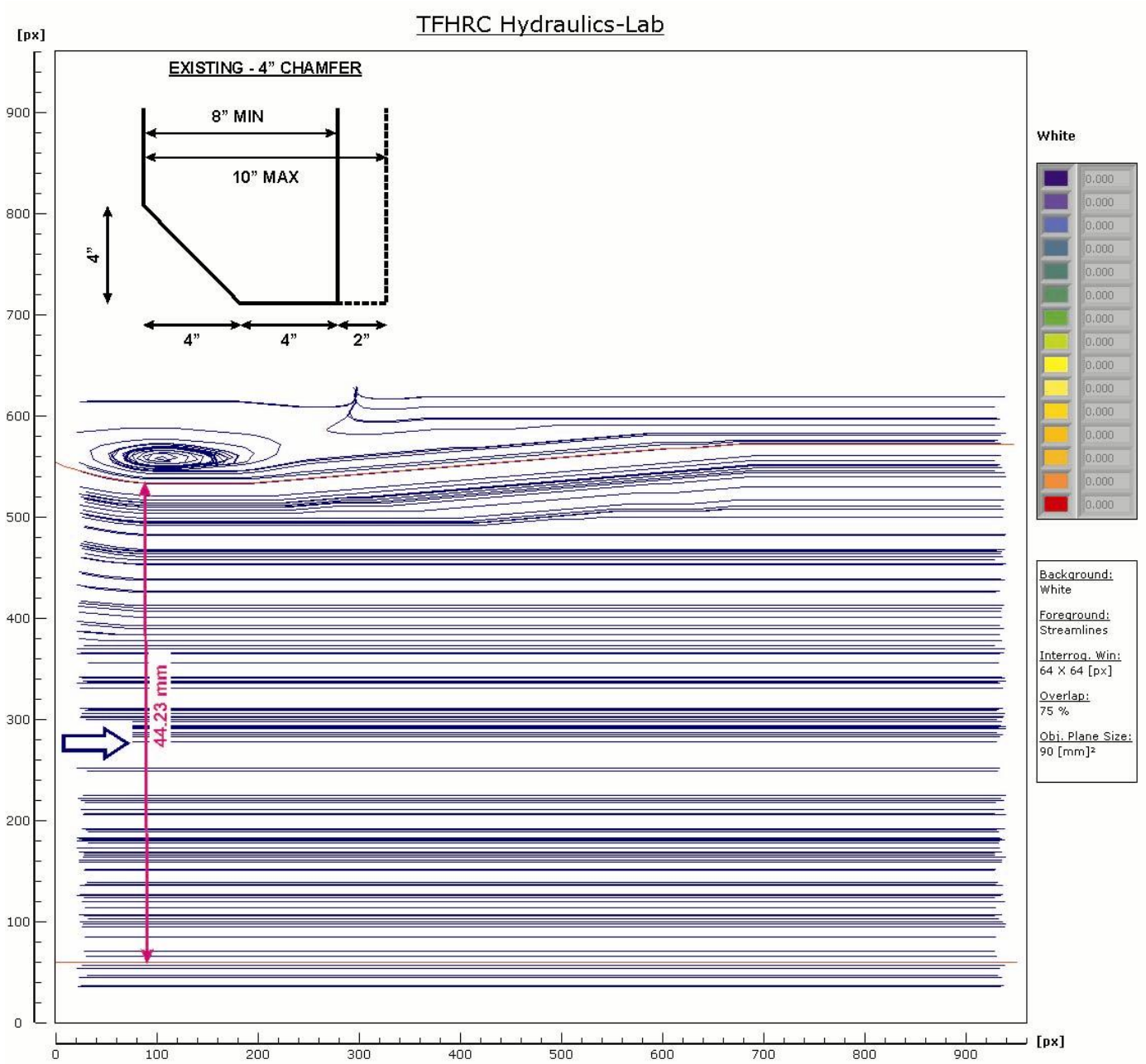
TASK 1. Optimize Bevel Edges for WW and Top Edges



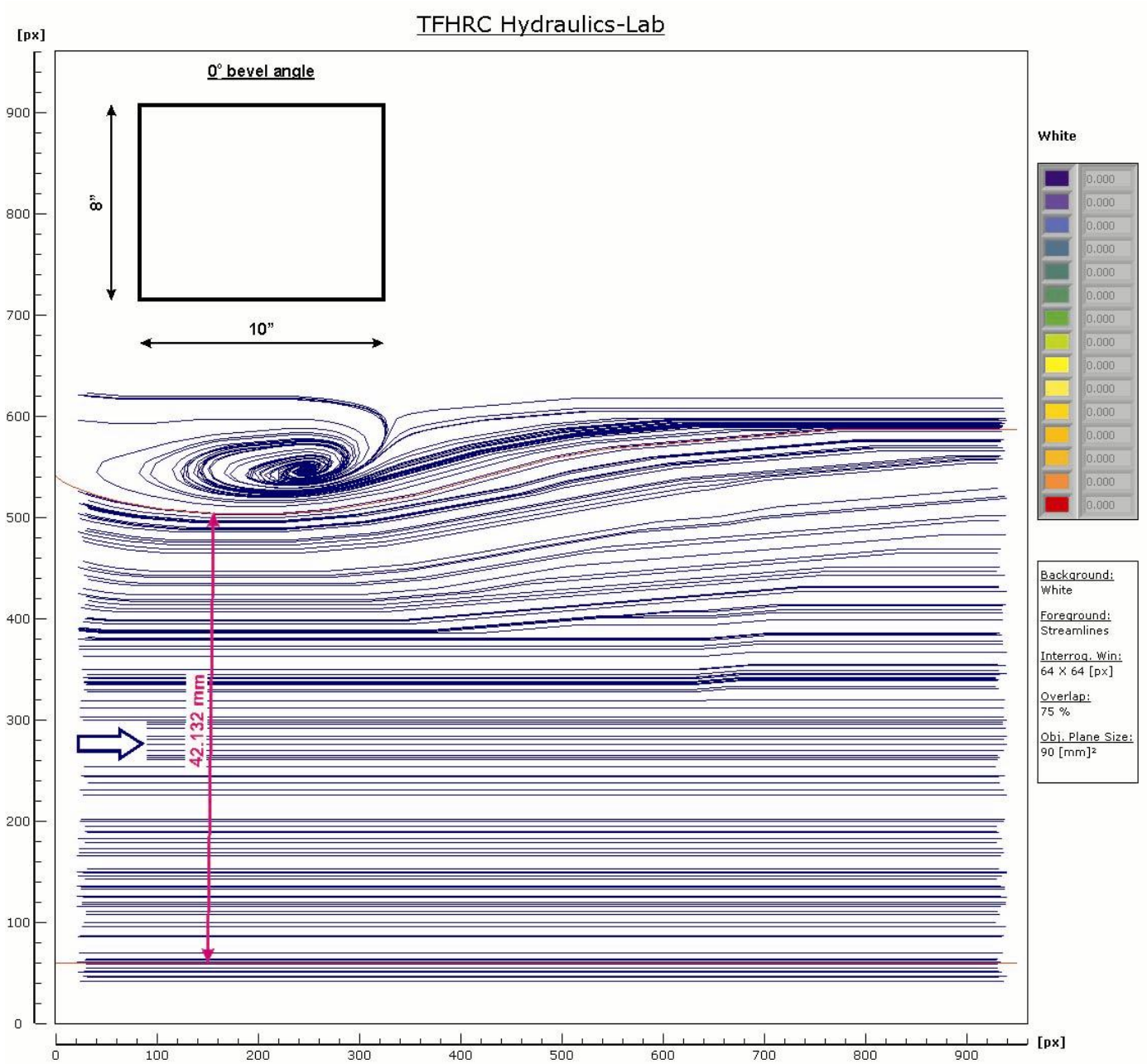
EXPERIMENTAL ARRANGEMENT FOR PIV WITH VERTICAL LIGHT SHEET



STREAMLINES FOR EXISTING 4” CHAMFER



STREAMLINES FOR 0^{o} BEVEL ANGLE



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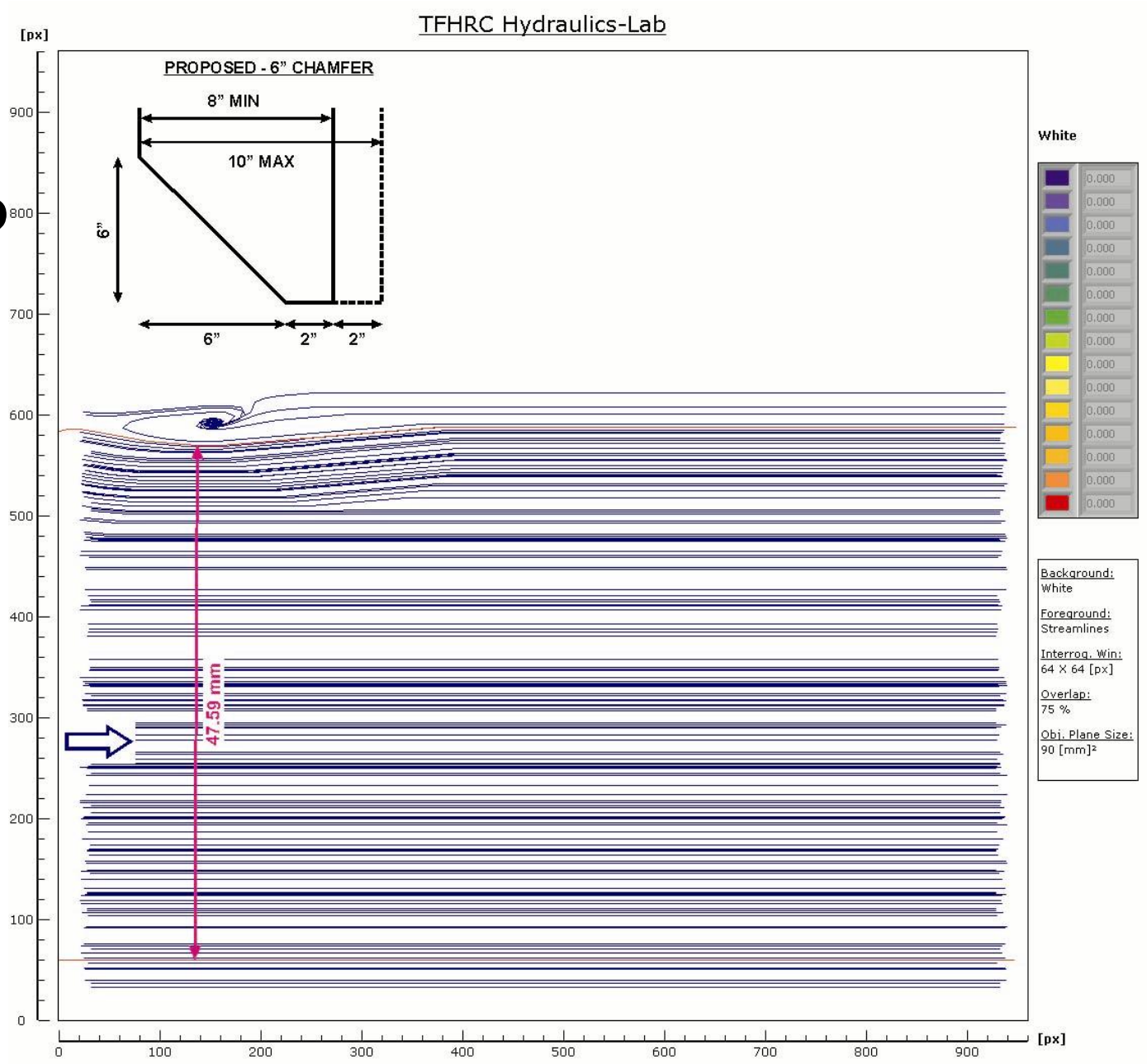
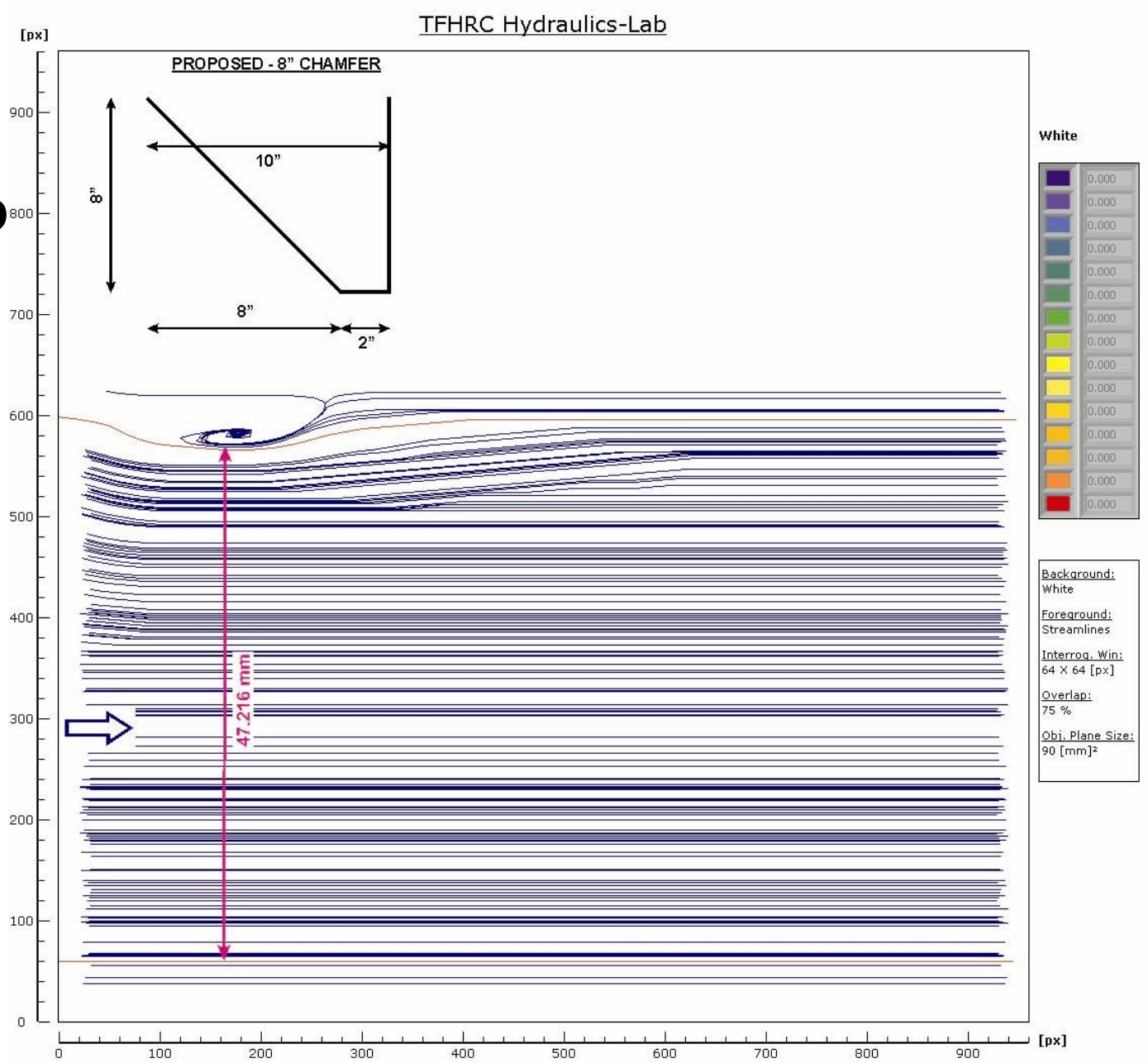
STREAMLINES FOR PROPOSED 6” CHAMFER



STREAMLINES FOR PROPOSED 8” CHAMFER



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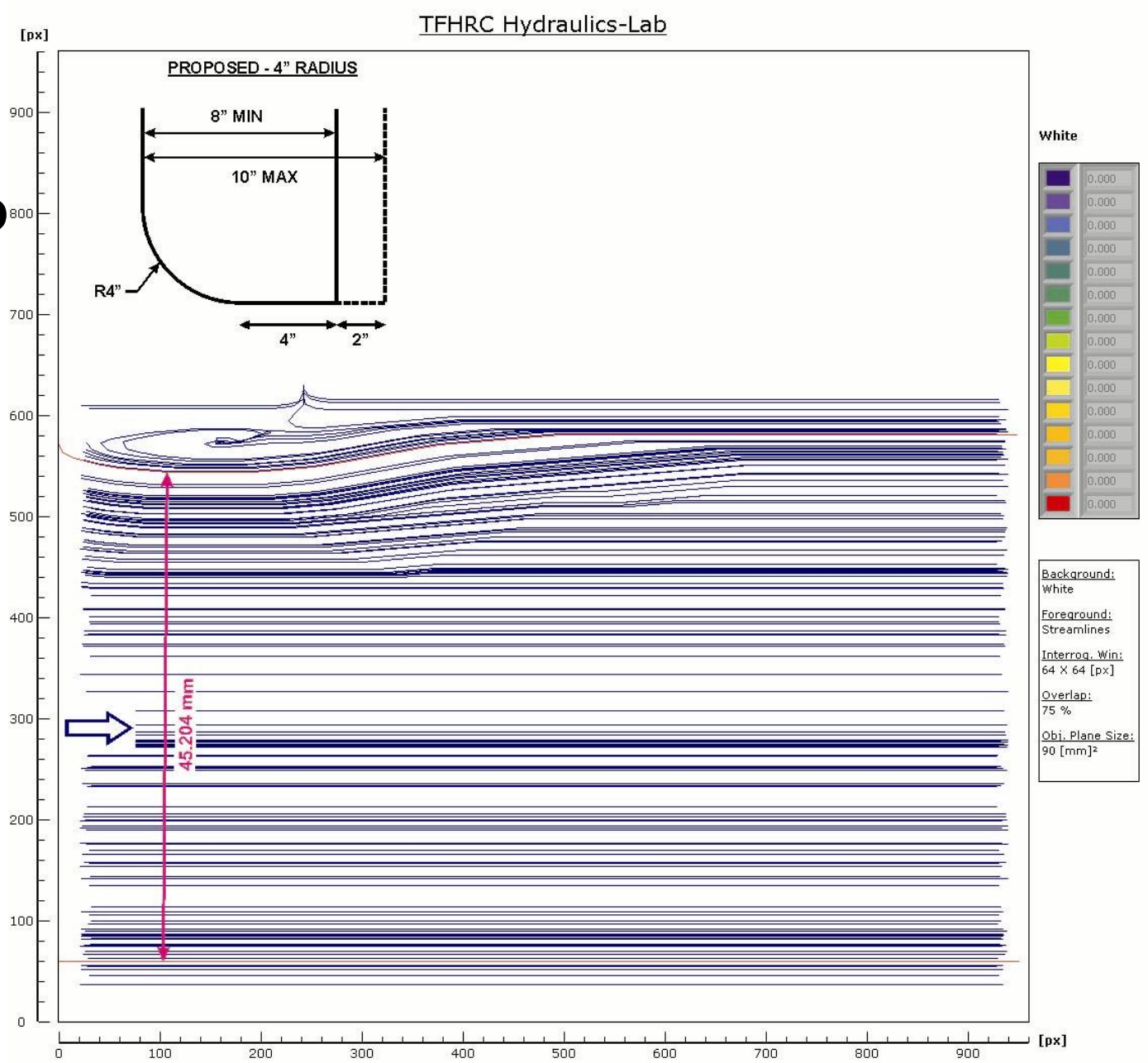
STREAMLINES FOR PROPOSED 4” RADIUS



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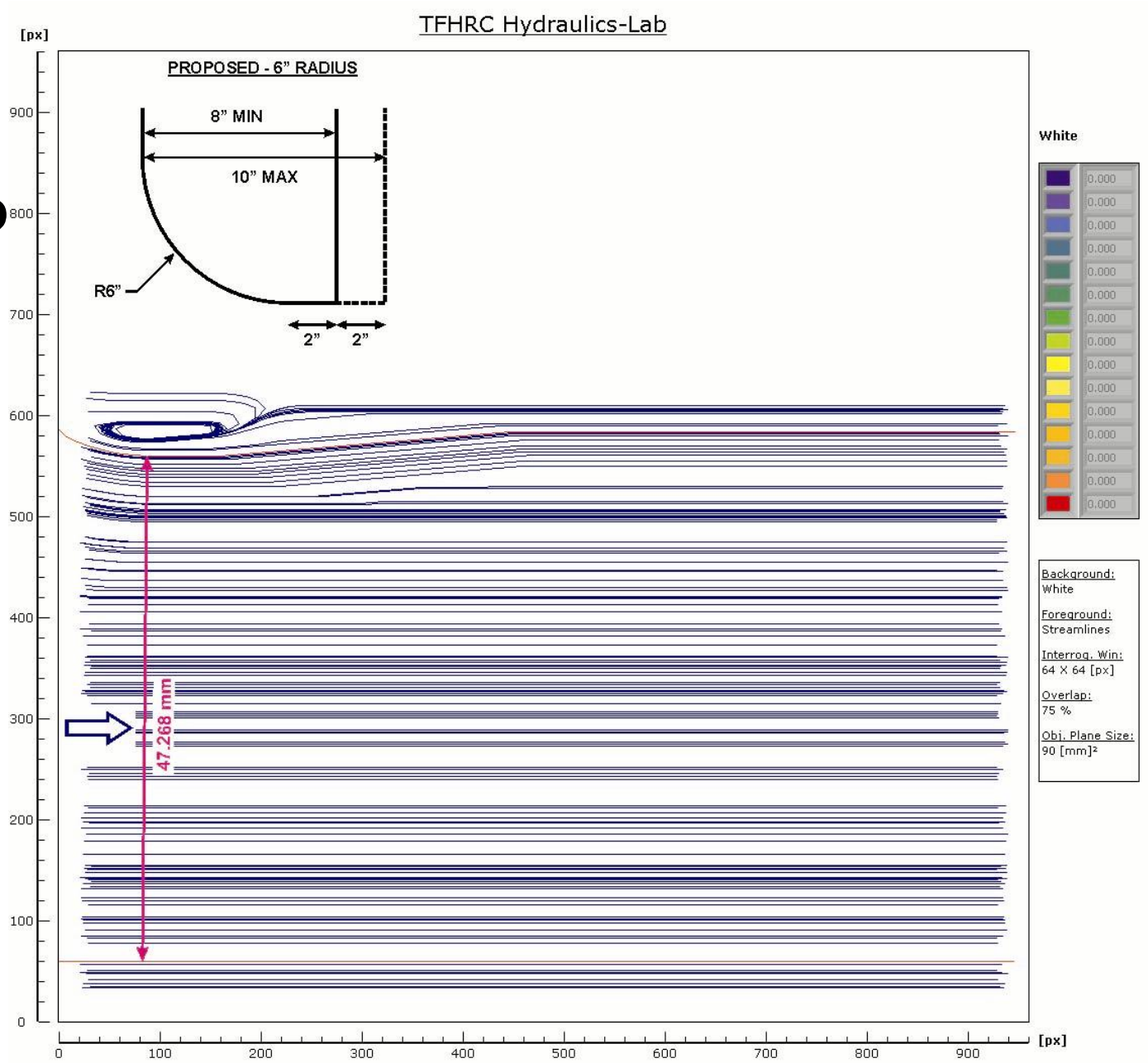
STREAMLINES FOR PROPOSED 6” RADIUS



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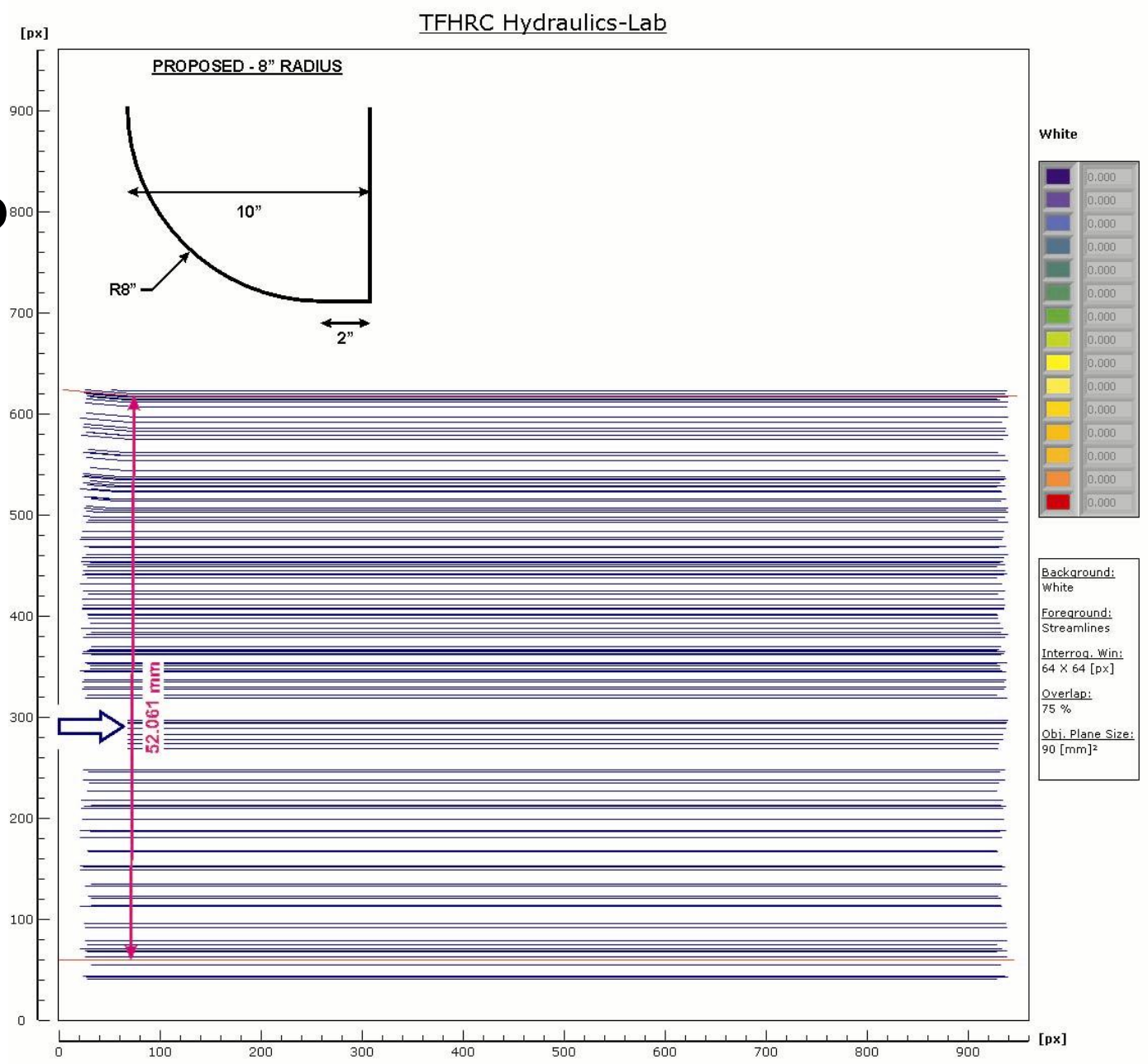
STREAMLINES FOR PROPOSED 8” RADIUS



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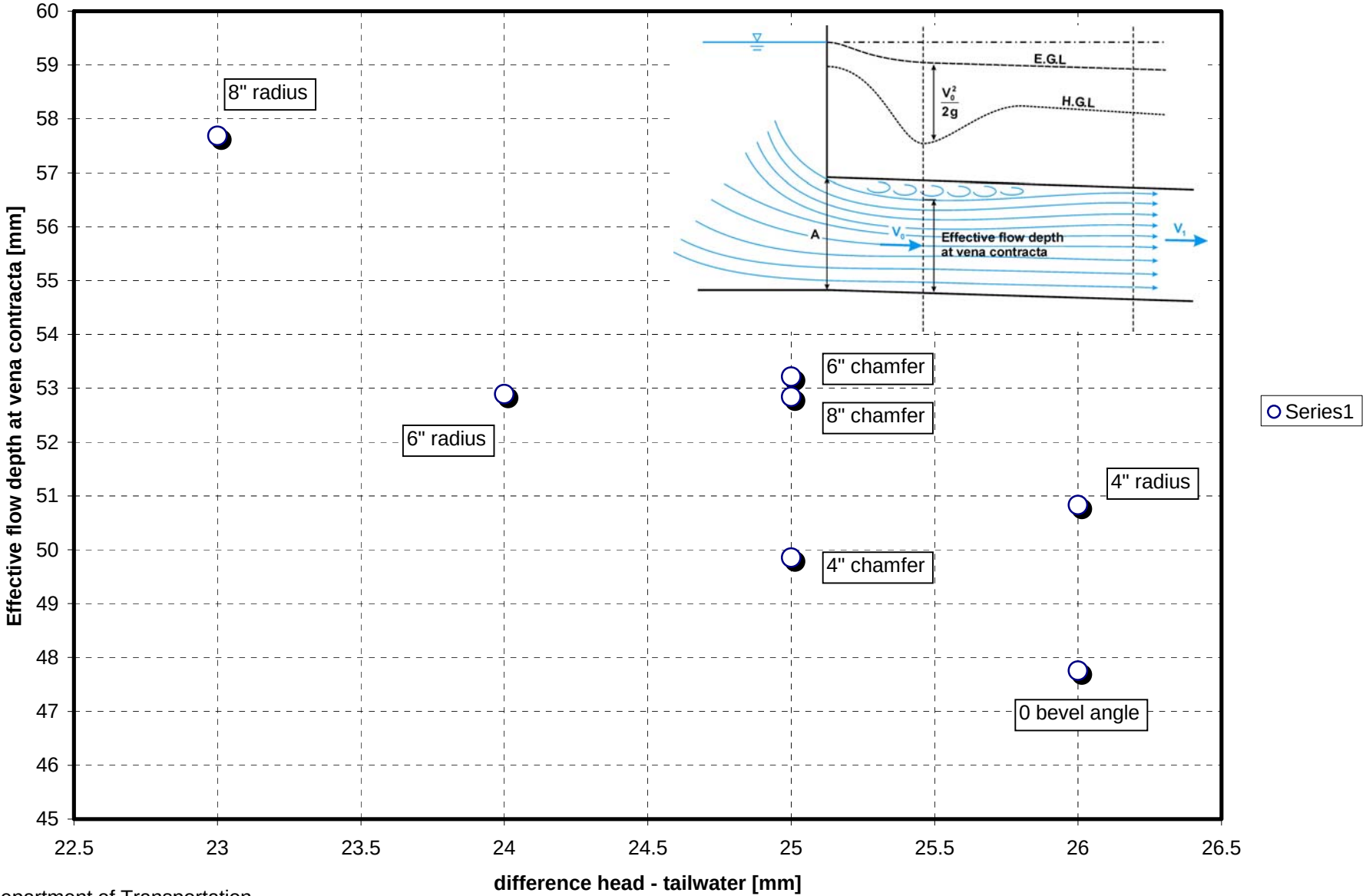
EFFECTS OF BEVELS



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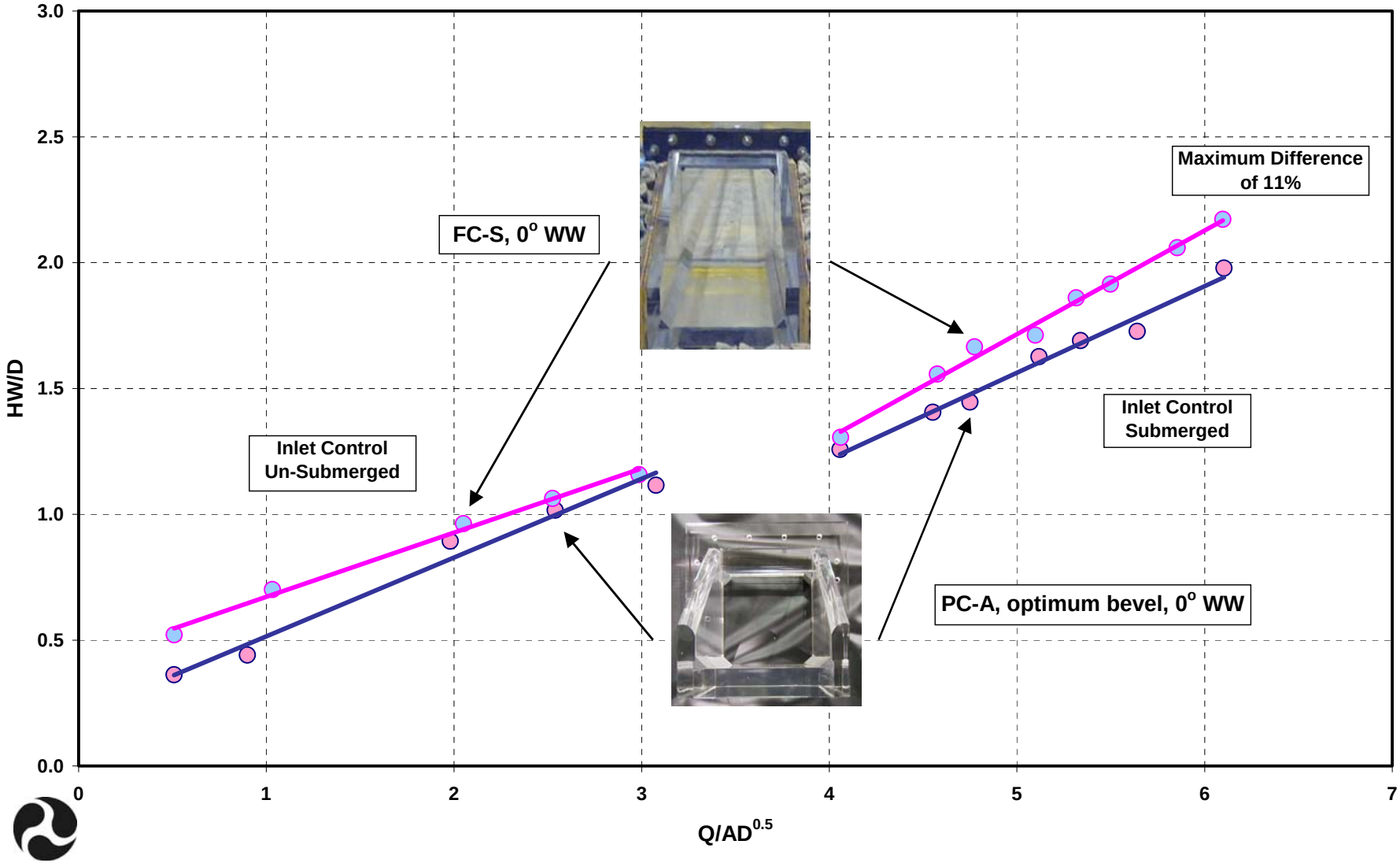
EFFECTS OF BEVELS



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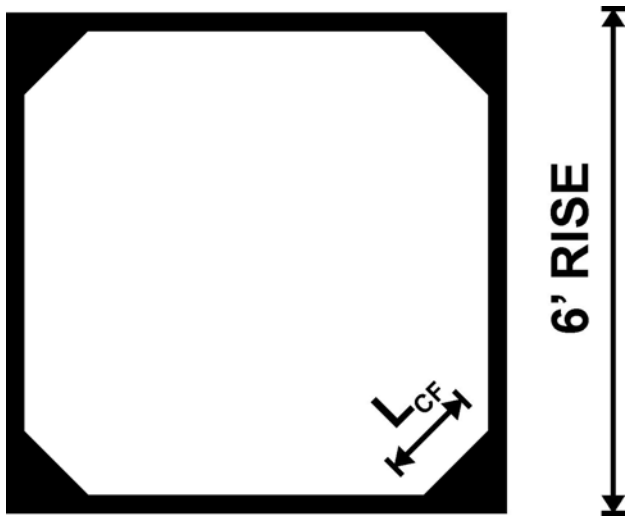
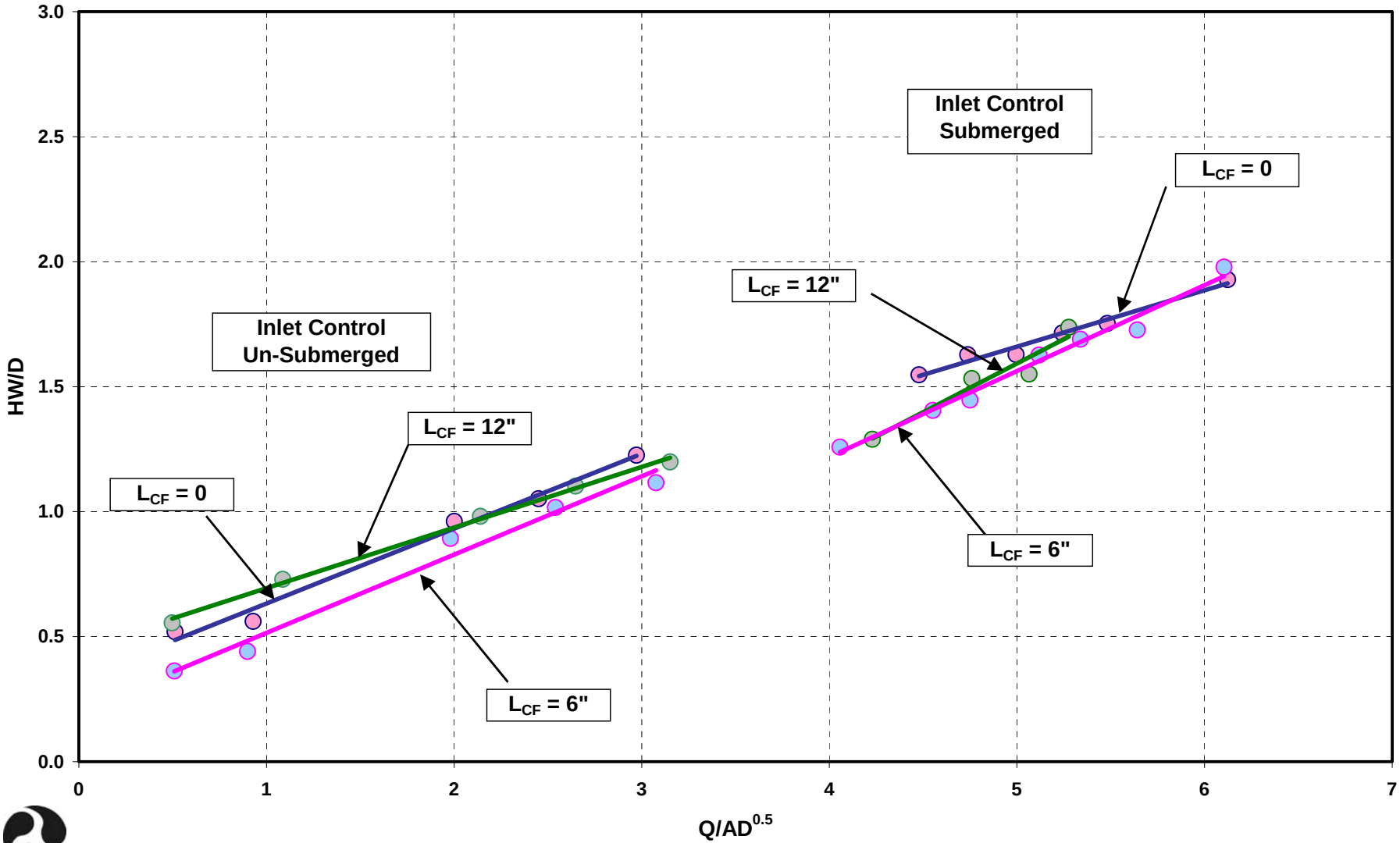
EFFECTS OF CORNER FILLETS



L_{CF} = LENGTH OF CORNER FILLET = 0", 6" AND 12"

EFFECTS OF CORNER FILLETS FOR 6x6 PC-A CULVERT



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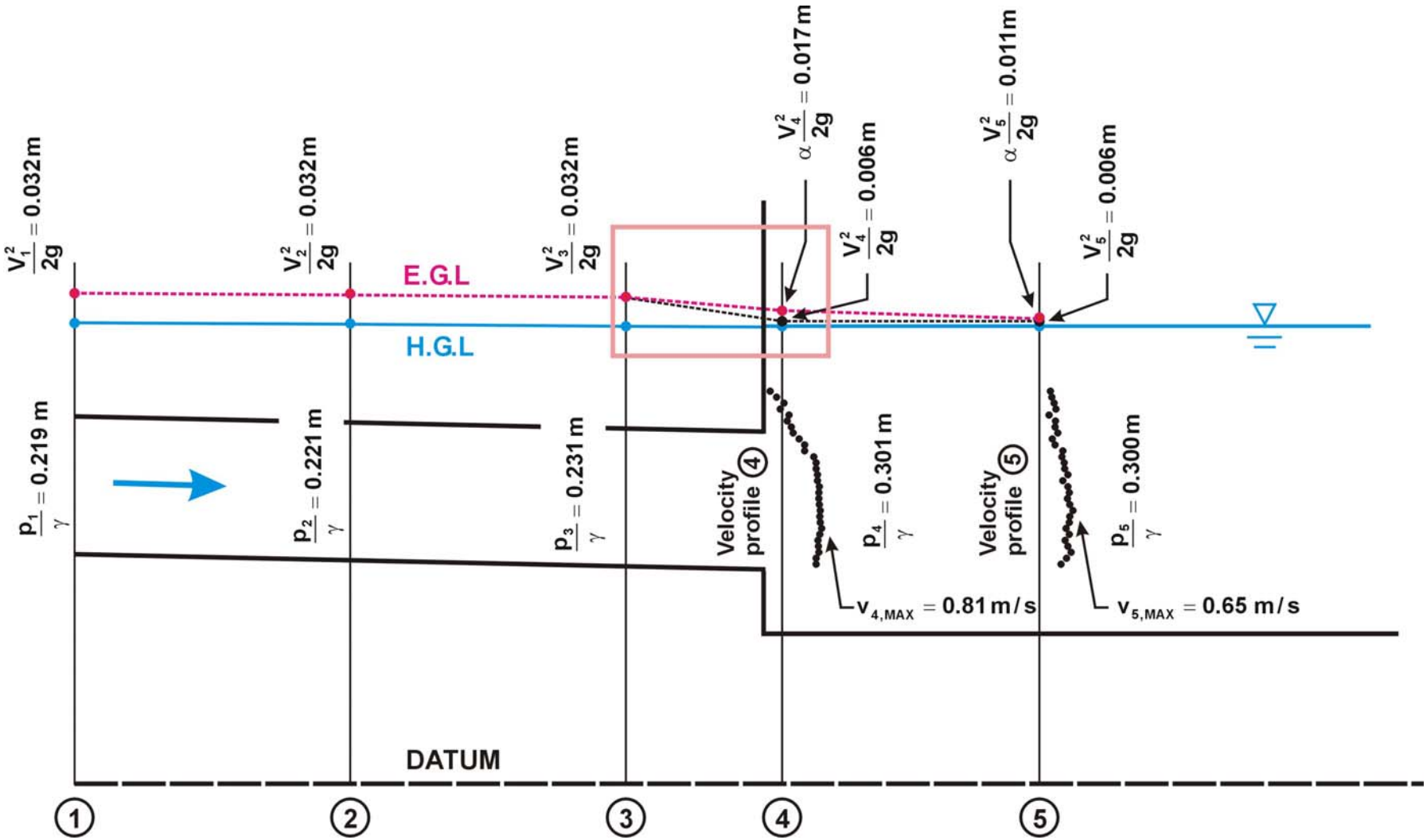
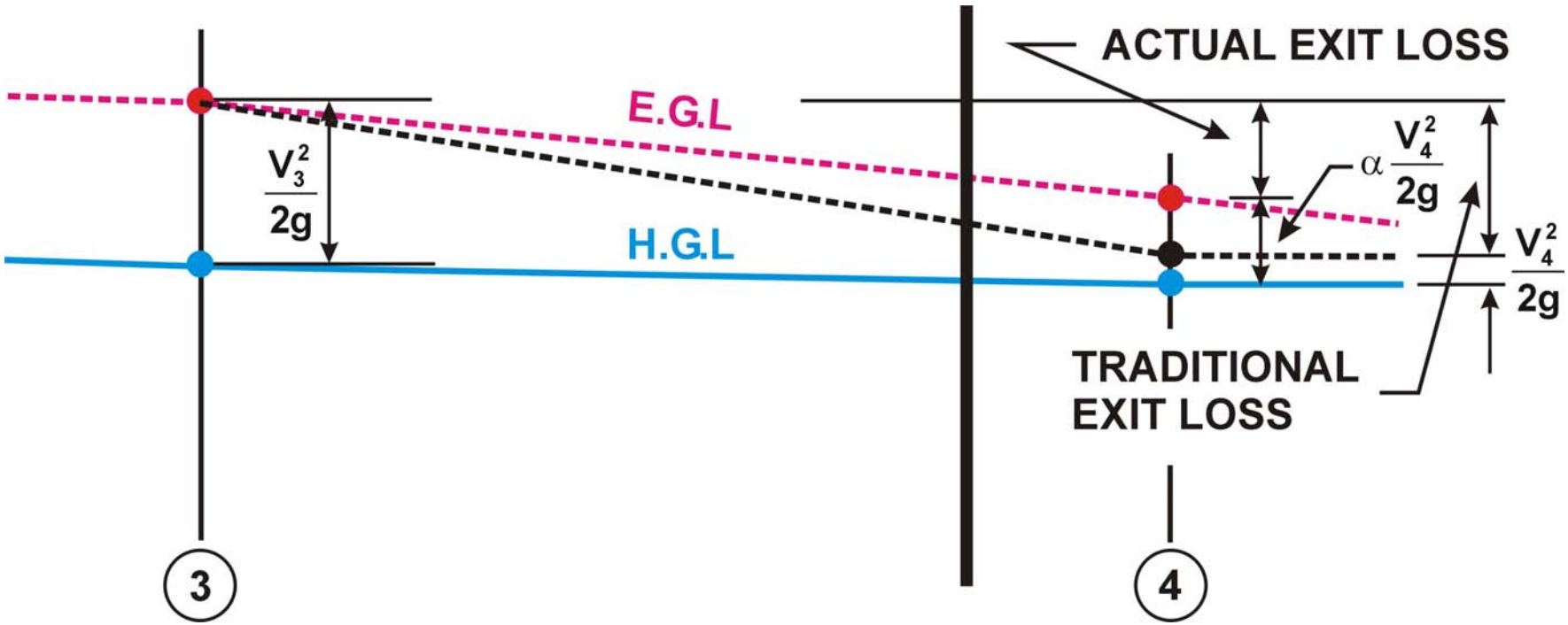
ACTUAL VS TRADITIONAL EXIT LOSS



ACTUAL VS TRADITIONAL EXIT LOSS (CONT'D)

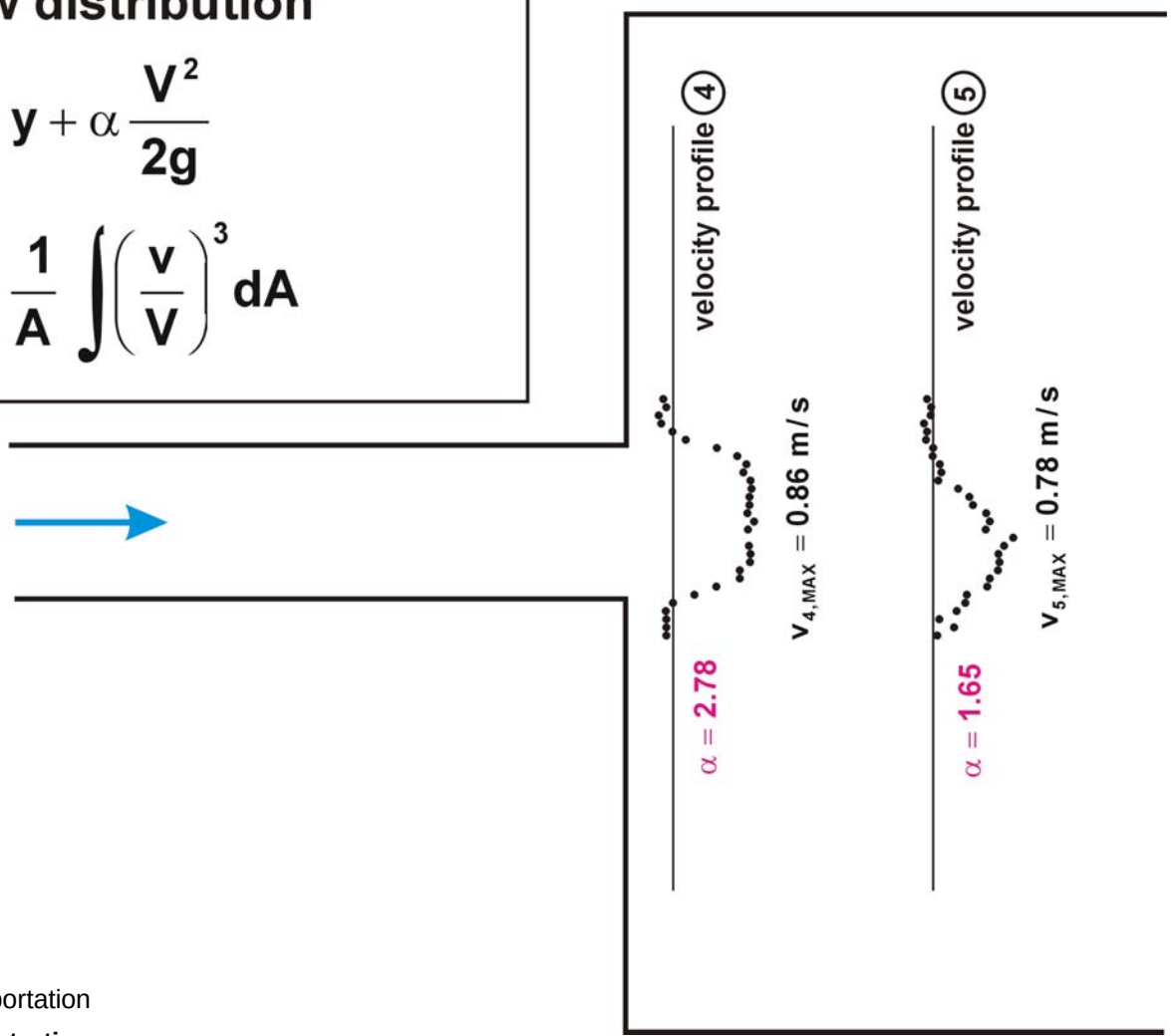


ACTUAL VS TRADITIONAL EXIT LOSS (CONT'D)

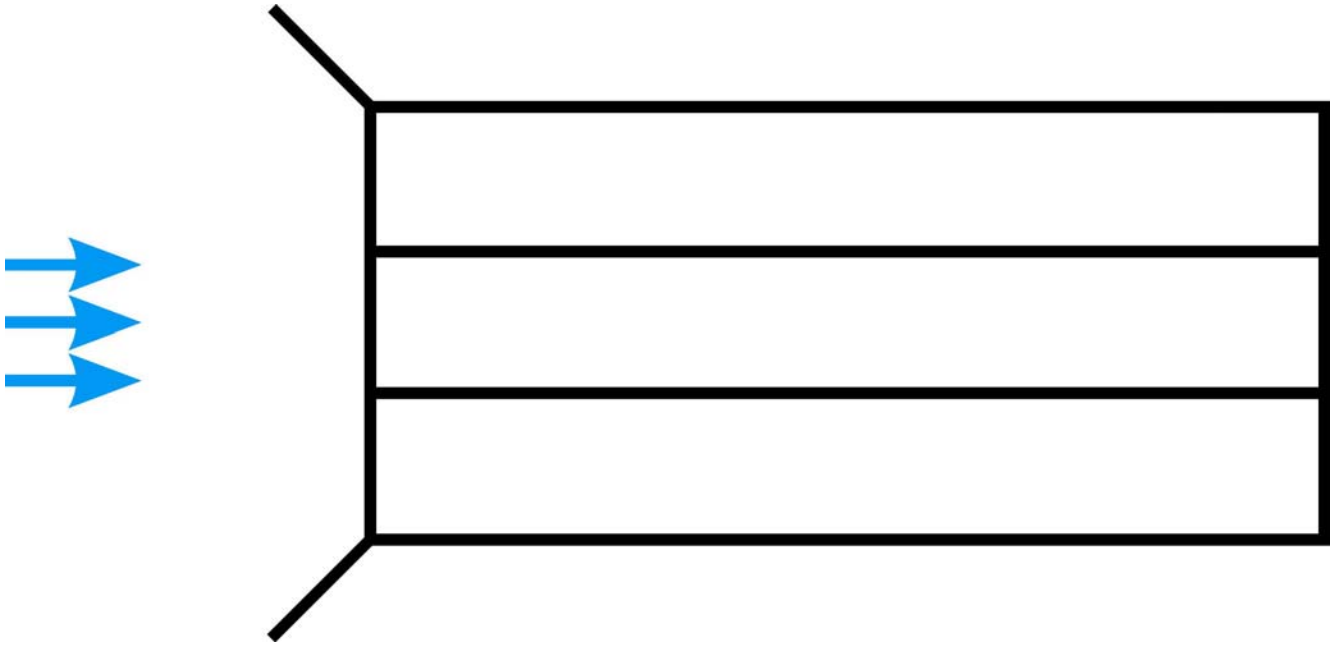
Non uniform Transverse flow distribution

$$E = y + \alpha \frac{V^2}{2g}$$

$$\alpha = \frac{1}{A} \int \left(\frac{v}{V} \right)^3 dA$$



TASK 2: Effects of Multiple Barrels

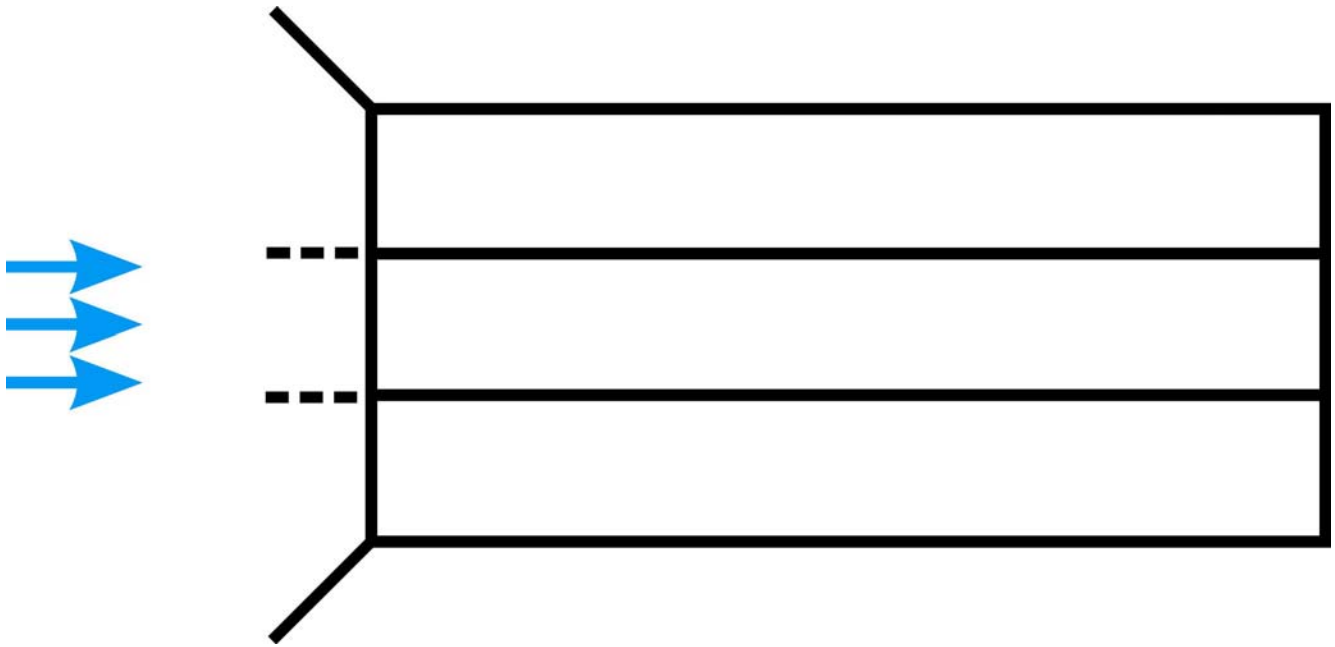


2, 3 AND 4 BARRELS

0° PRECAST (PC) WW

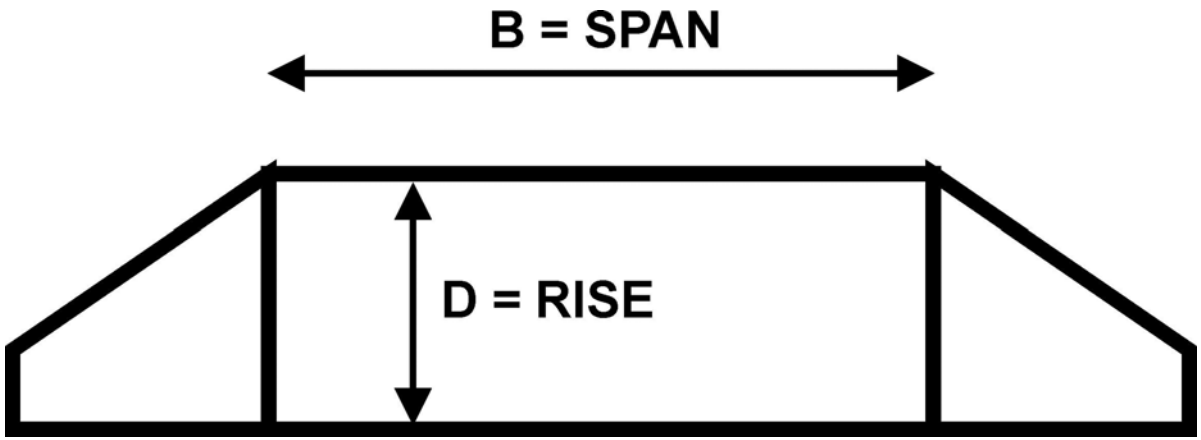
0° AND 30° FC WW

MULTIPLE BARREL TESTS (CONT'D)



SOME SERIES W/ INNER WALLS EXTENDED

TASK 3: Effects of Span to Rise

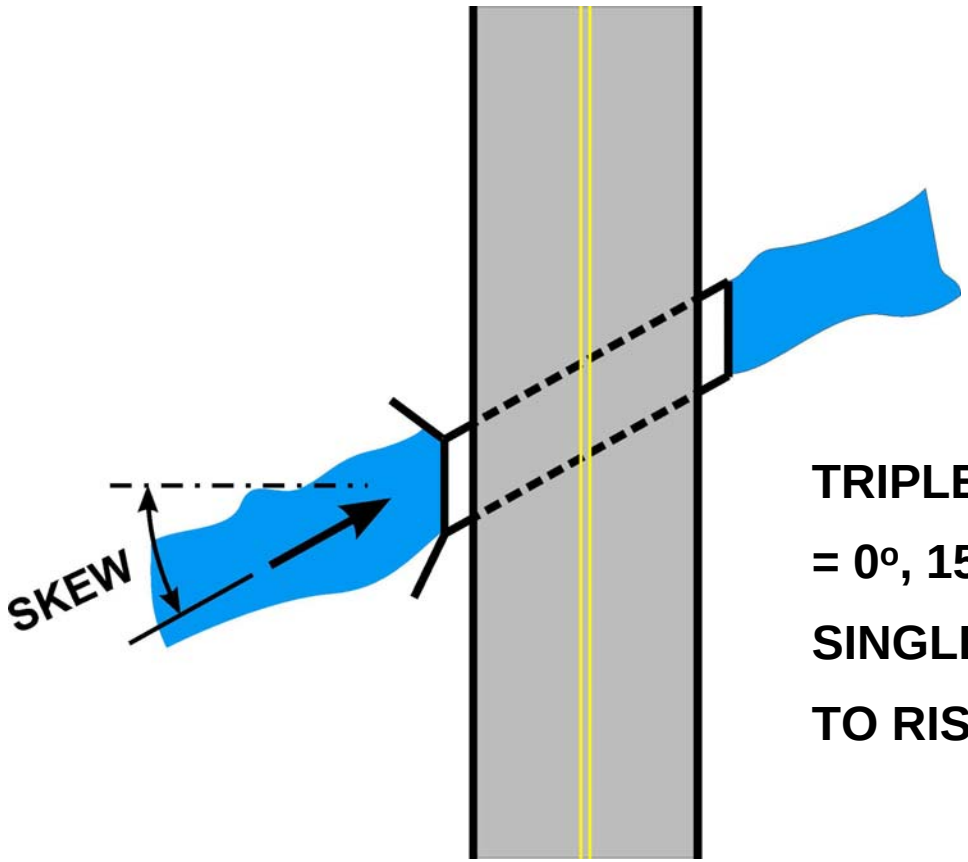


B/D = 1:1, 2:1, 3:1 AND 4:1

single bbl w/ FC WW = 0^{o} AND 30^{o}

<u>EXTRA:</u> USE OPTIMUM P.C. WW's AT 0^{o}

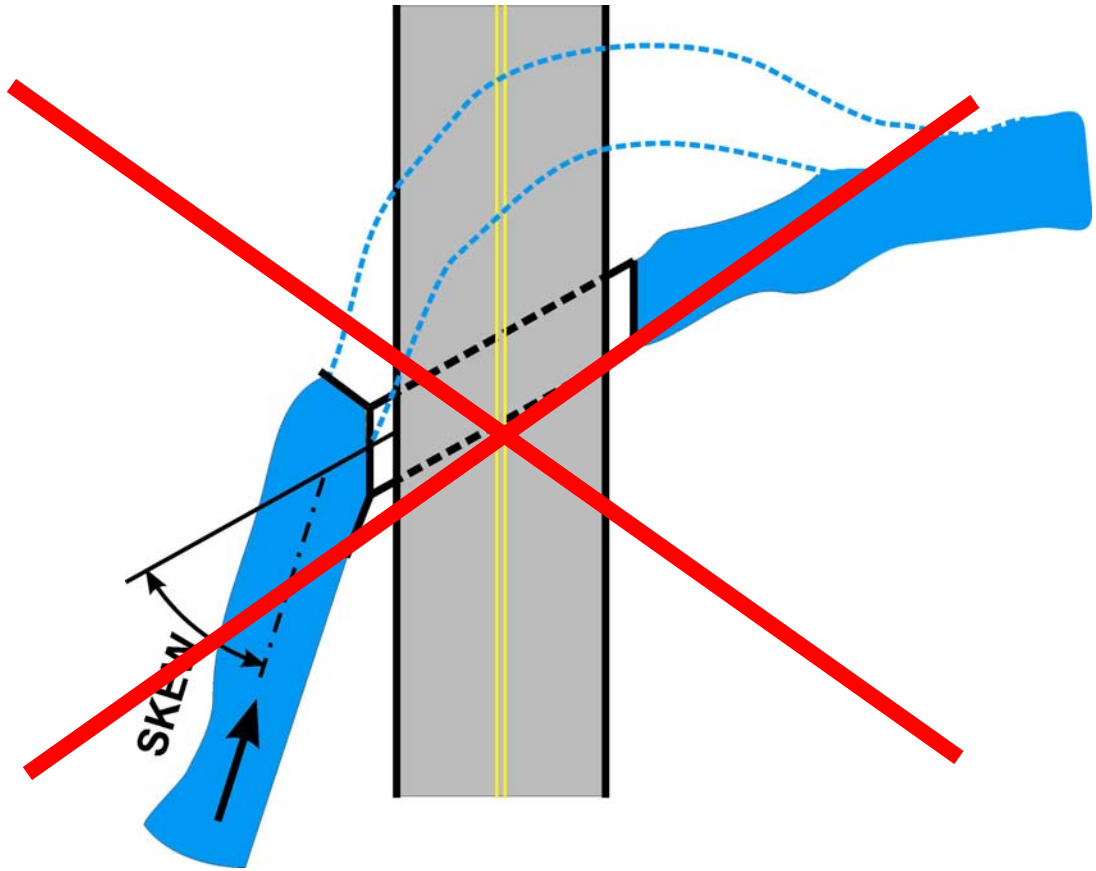
TASK 4: Effects of Skewed Flow



TRIPLE BARREL CULVERT SKEW ANGLE = 0^{o}, 15^{o}, 30^{o} AND 45^{o}

SINGLE BARREL CULVERT W/ 3:1 SPAN TO RISE, SKEW ANGLES = 0^{o}, 30^{o}

SKEWED FLOW (CONT'D)

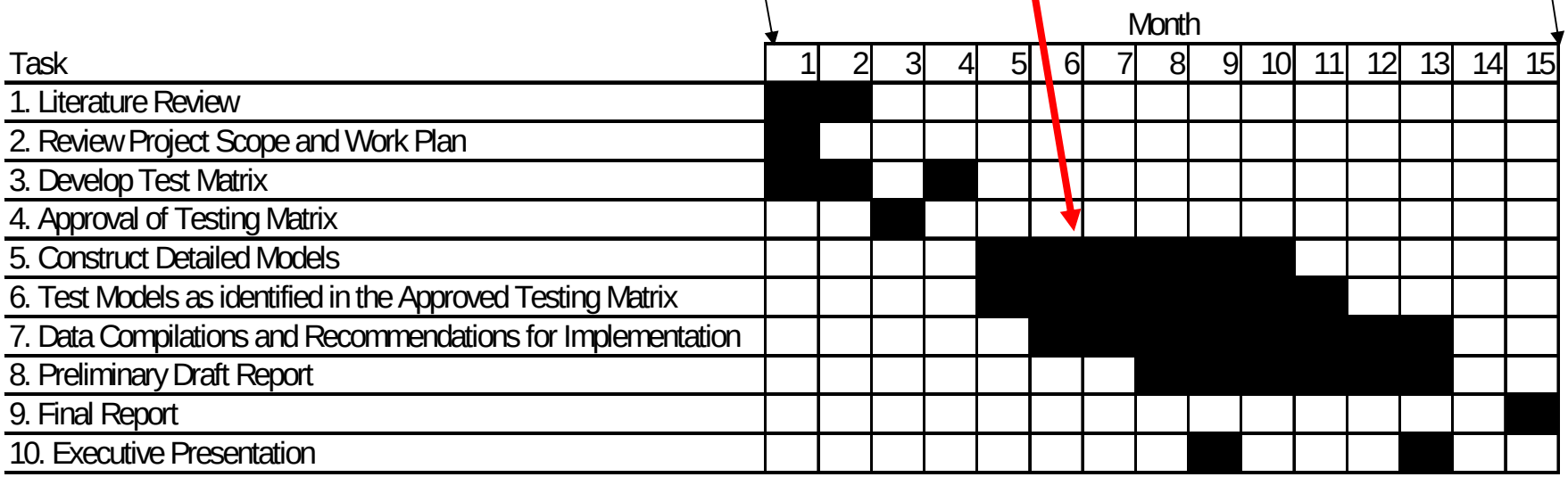


SKEWED FLOW TEST NOT BEING DONE!

Scheduled Completion 01/02/04

Start date 10/02/02

Status 08/19/03

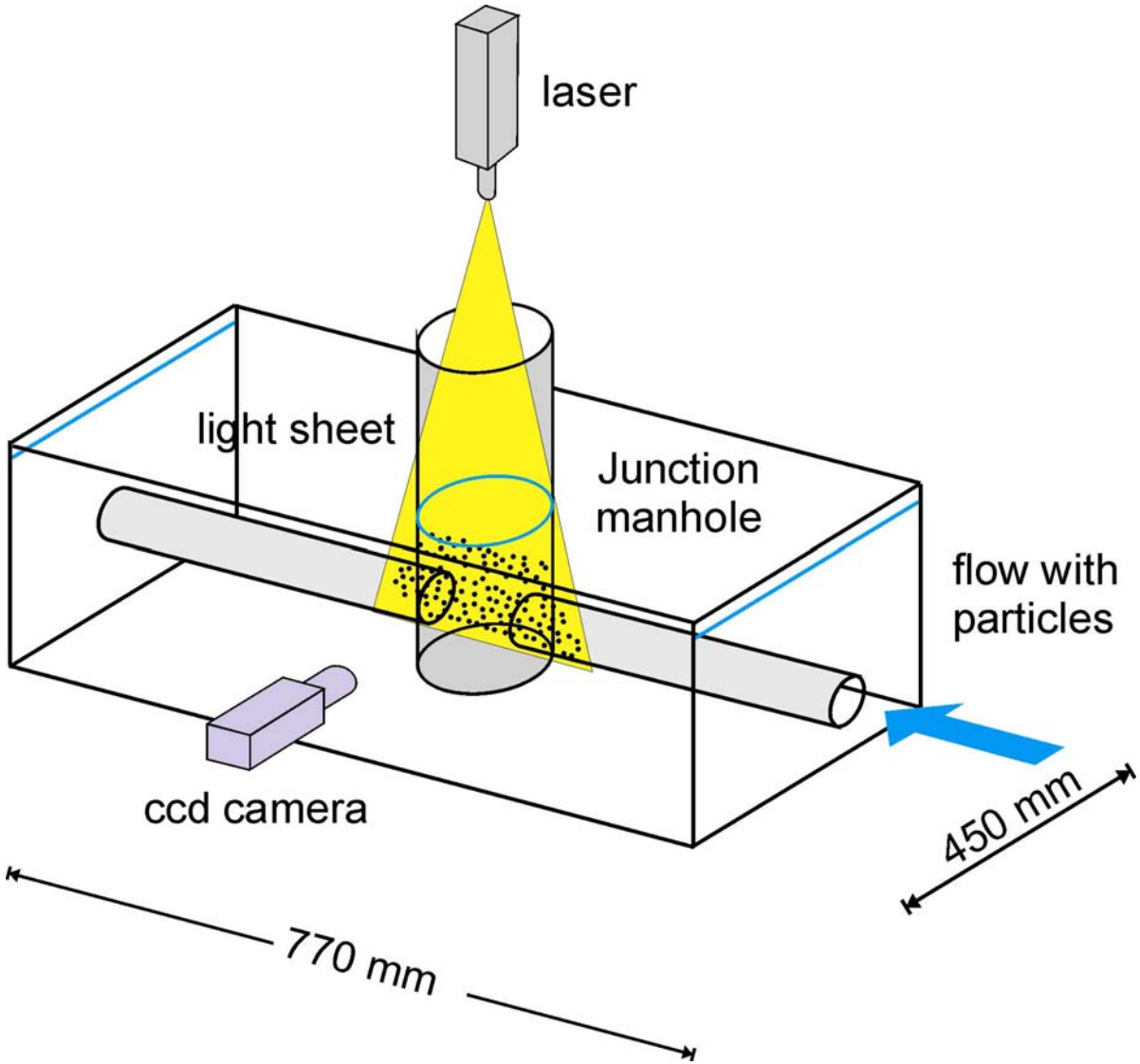


Deliverables:

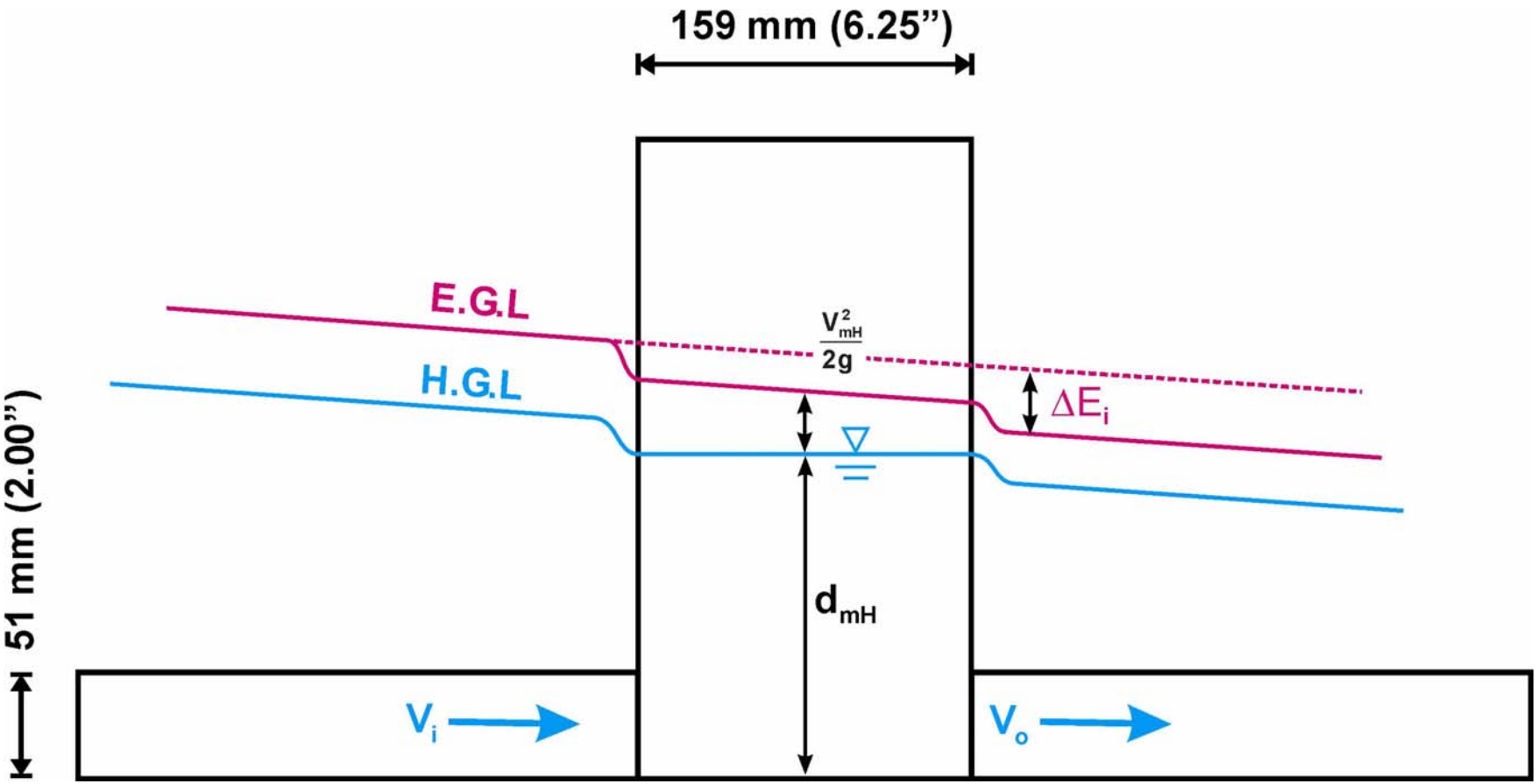
- Final Report w/ nomographs and 5th order polynomials for future updates of HDS-5
- Executive summary
- Excel Spreadsheet with all model test results
- Digital photographs as requested

ENERGY LOSSES THROUGH JUNCTION MANHOLES

EXPERIMENTAL ARRANGEMENT FOR JUNCTION MANHOLE TESTS USING PIV WITH VERTICAL LIGHT SHEET



ENERGY GRADE LINE AT A JUNCTION MANHOLE



NCHRP

NCHRP

- **15-23 Unit Conversions for AASHTO MDM & Guidelines**
  - Contractor: Roy Jorgenson ASSOC. (Shearin)
  - Effective Dates7/11/01 to 3/11/03

  15-24 Hydraulic Loss Coefficients for Culverts
  - Utah State Univ (Dr. Tullis)
- **21-7 Portable Scour Monitoring Equipment**
  - Contractor: Ayres (Jim Schall)
  - Effective Dates: 5/2/00 to _____

NCHRP

- **21-5(2) Determination of Unknown Subsurface Bridge Foundations**
  - Contractor: Olson Engineering
  - P.I. Larry Olson
  - COMPLETE
- **24-14 Scour at Contracted Bridge Sites**
  - Contractor: Univ of Louisville/USGS
  - P.I.: Art Parola and Dave Mueller

NCHRP

- **24-15 Bridge Scour in Fine Grained (Cohesive) Sediments**
  - Contractor: Texas A&M (Briaud)
- **24-16 Effect of Incremental Channel Change on Bridge Scour**
  - Contractor: Ayres Assoc. (Lagasse)
  - COMPLETE Aug/03

NCHRP

- 24-18 Countermeasures to Protect Abutments
  - Contractor: Univ of Miss/Mich State (Barkdoll)
  - Dates:7/11/01 to 3/11/03

- 24-19 Environmentally Sensitive Channel and Bank Protection
  - Contractor: Salix Applied Earthcare (McCullah)
  - Dates:5/30/01 to 5/30/04
- 24-7(2) Countermeasures to Protect Piers
  - Contractor: Ayres Assoc. (Lagasse & Clopper)
  - Dates:4/01/01 to 10/01/04

NCHRP

- 24-20 Prediction of Abutment Scour
  - Contractor: Univ of Iowa (Ettema)
  - Panel met in Iowa City July 03
- 24-23 Riprap Design Criteria
  - Contractor: Ayres Assoc.

NCHRP

NEW for 2004:

- **24-24 Criteria for Selecting Hydraulic Models**
- **24-25 RISK BASED Guidelines for Determining Need for Investigation of Unknown Bridge Foundations**
  - **Panel meets 10/02/03**
- **24-26 Effects of Debris on Pier Scour at Bridges**
  - **Panel meets 10/09/03**
- **24-?? Research Needs for Bridge Scour**
  - **Working panel (Larry Arneson will chair)**

BUBBLE:

Scour at Long and Wide Piers

Questions/Comments